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Study motivation before and after the switch to distance learning - a self-determination theory approach

Müller, Florian H.[1]; Thomas, Almut E.[2]; Carmignola, Matteo[3]; Dittrich, Ann-Kathrin[4]; Eckes, Alexander[5]; Großmann, Nadine[6]; Martinek, Daniela[3]; Wilde, Matthias[6]; Bieg, Sonja[7]
Organization(s): 1: University of Klagenfurt, Austria; 2: University College Carinthia, Austria; 3: University of Salzburg, Austria; 4: University of Innsbruck, Austria; 5: University of Osnabrück, Germany; 6: University of Bielefeld, Germany; 7: University College Weingarten, Germany.

Abstract
Following the declaration of the COVID-19 pandemic by the WHO in March 2020, several countries in the world had to switch to the "online" mode of conducting instruction in schools and universities. This study aims to compare the motivational regulation of university students in Austria and Germany before and after the transition to online learning during the COVID-19 crisis and to find explanations for the quantity and quality of motivational regulation. The study compares two sample groups: one before distance learning (N = 730) and the other during distance learning (N = 1835). Using data from an online survey designed on the basis of the self-determination theory (SDT, Ryan & Deci, 2017), the study findings primarily indicate that intrinsic motivation in distance learning is significantly lower, and extrinsic forms of motivation were higher than in the scenario before the COVID-19 crisis.
SDT assumes that the satisfaction of psychological basic needs (BPNS) for autonomy, competence and social relatedness is associated with motivational regulation. In distance learning, the satisfaction of competence and social relatedness is significantly lower.
In a structural equation model the intrinsic and identified regulation can be explained in particular by the satisfaction of autonomy (β = .60 / ß = .71) and competence (β = .30/ β = .14). Social relatedness does not prove to be a predictor of motivational regulation styles in distance learning. Only the satisfaction of competence turns out to be relevant for explaining introjected (subscales: avoidance/approach) and external regulation (β = -.23, β = .07/ β = .12).

1. Distance learning and studying under pandemic restrictions

The higher education sector has been significantly affected by the consequences of the Covid-19 pandemic. This particularly affects teaching and student life. In order to maintain teaching operations, institutions have had to react quickly and switch from the face-to-face model to distance learning, which has meant that students have to deal with new information and communication technologies. To what extent this circumstance affects the quality of learning and, in particular, students' motivation to learn is an interesting but largely open question from a scholarly perspective (see Wong, 2020).
The COVID-19 pandemic has not only changed the culture of teaching and learning, it has also had a significant impact on students' quality of life and emotional experience (e. g. Adnan & Anwar, 2020; Lie et al., 2020; Mechili et al.,2020). Wong's (2020) study, for example, used Ryan and Deci's (2017) self-determination theory to examine whether students perceived basic psychological needs for social relatedness, competence, and autonomy to be met in an online learning situation. The results show that students' basic needs were partially met by online learning. This mainly concerns the two Needs for Autonomy and Competence. Learners enjoy the freedom of learning, the proactive nature of their learning process, and the opportunity for deep thinking without time constraints or experienced pressure from instructors. However, there was less agreement regarding social relatedness due to less social and physical interaction with teachers or peers. Overall, motivation to learn appears to suffer under pandemic conditions (Wong, 2020).

Adnan & Anwar (2020) also point out that the new learning environment has an impact on learner motivation and socialization. 71.4% of students disagree with the notion that online learning is more motivating than conventional learning, which they attribute to the limited social interaction. Händel et al. (2020) or Kedraka & Kaltsidis (2020) also point out the limited social interaction that fosters negative emotions. In addition, the findings of Kedraka & Kaltsidos (2020) also show a clear preference of students for face-to-face instruction.

To address the question of how the switch to distance learning affects students' motivation at university, a study was designed using self-determination theory (Ryan & Deci, 2017) as a conceptual basis. The study compares pre-pandemic data with current data from spring and early summer of 2020. The study aims not only to further contribute to understanding learning and learning motivation in times of crisis, but also to point to opportunities and limitations of motivational support in distance learning (see also Martinek, et al., 2021).

2. Theoretical approach

The theoretical basis of the study is self-determination theory (SDT, Ryan & Deci, 2017), which is a functional theory of motivation that can describe and explain in detail the interaction of motivational conditions in the environment and motivational regulation. In contrast to other theories of motivation, SDT distinguishes *four regulatory styles of extrinsic motivation* in addition to *intrinsic motivation*, which can be arranged on a continuum from heteronomous control to self-determination (see figure 1).

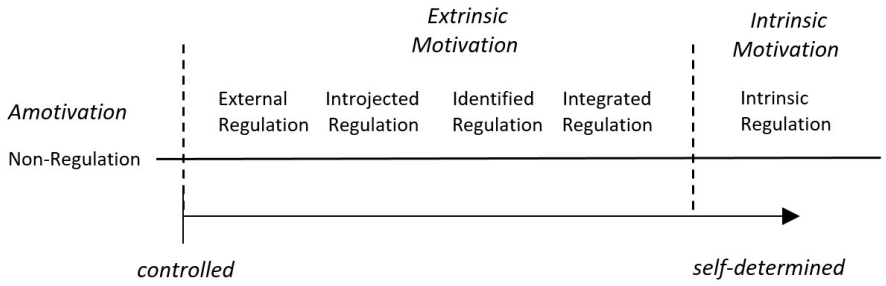

Figure 1. Continuum of self-determination (based on Ryan & Deci, 2002, p. 16)

Self-determined forms of motivation are associated, for example, with higher retention in educational institutions, achievement, satisfaction, vitality or wellbeing (Chirkov & Ryan, 2001; Núñez & León, 2016; Patrick et al., 2000; Sheldon & Krieger, 2007; Taylor et al., 2014; Thomas et al., 2018, Vallerand et al., 1997).

In SDT, the satisfaction of the so-called *basic psychological needs* (BPNS) for autonomy, competence and social relatedness is essential for the maintenance or development of self-determined forms of motivational regulation.
Autonomy is the need to experience volition regarding one's behaviors. This need is satisfied when a person has free choice and room for maneuver, but as long as the requested behavior is in harmony with endorsed values one can experience autonomy. The need for *competence* is satisfied when a person can rise to a challenge but not so with the completion of easy tasks (Ryan & Deci, 2017). *Relatedness* is the need to feel connected with and cared for by important other people. The need for relatedness can be satisfied when a person is cared for and treated with respect and appreciation unconditionally (La Guardia & Patrick, 2008; Ryan & Deci, 2000).

In addition, the basic needs provide information and feedback on the quality of the person-environment interaction (Krapp, 2005). This quality is particularly important in the educational context, since learning and teaching are directly linked to people and their (learning) environment.
In accordance with the rationale of SDT, we investigated the question to what extent the characteristics of the motivational regulation styles (external, introjected, identified and intrinsic) as well as the satisfaction of basic needs differed in university studies before the change to distance learning. In addition, it was investigated whether the satisfaction of basic needs can explain motivational regulation.
Learning environments can contribute to BPNS by either supporting or thwarting students' basic psychological needs. such changes in BPNS affect the quality of students' motivation, their well-being, and ill-being (Aelterman et al., 2019; Wang et al., 2019).

3. Research questions

This paper addresses the question to what extent motivational regulation styles and BPNS differ before and after the switch to distance learning. According to the empirical findings presented above, autonomous motivation is assumed to be lower and controlled forms of motivation higher in distance learning. For the *subscale approach* (introjected regulation), it is assumed that it is lower in distance learning - due to its conceptual relation to self-esteem enhancing contingencies (see section 4 in this paper for the conceptualization of the two subscales of introjected regulation: *approach* and *avoidance*).
It is assumed that in distance learning the BPNS is rated lower. Moreover, both aspects of social relatedness (peers and faculty) should be reduced in distance learning.

Hypotheses
1. The two autonomous forms of motivation (intrinsic and identified regulation) are lower in distance learning than before the switch to distance learning. Moderate to high effects are expected, since intrinsic motivation in particular depends on environmental change.
2. The controlled forms of motivation (introjected and extrinsic regulation) are higher in distance learning. Differentially consider, however, the values for the scale `approach´ of the introjected regulation should also decline.
3. BPNS should be lower after the switch to distance learning. It can be assumed that especially social relatedness is significantly lower.
5. BPNS explain the autonomous forms of motivation in distance learning.

4. Method

An online questionnaire was conducted among students at German and Austrian universities approximately 8 weeks after the switch to distance learning.
The data of the 1835 students can be compared inferentially with student data collected before the Covid-19 crisis. In addition, structural equation models were calculated to test the predictive power of BPNS in explaining motivation.
The following instruments were used in the survey study see also Martinek, et al., 2021).

Instruments
To elicit motivational regulation styles, the scales for motivational regulation in study (SMR-L, Thomas, Müller & Bieg, 2018) were used, which differentiates two autonomous (intrinsic and identified regulation) and two controlled forms (introjected and external regulation) of motivation:

The introjected regulation scale was captured by two subscales, approach and avoidance, in the instrument used (cf. Sheldon et al. 2017; Bieg et al 2020). The items generally refer to study, although the identical items were used in the distance learning study and the word `online study´ was used instead of `study´.

Scales with item examples
- Intrinsic regulation (I really enjoy learning in my studies)
- Identified regulation (I put myself into studying in order to be able to realize self-imposed goals)
- Introjected regulation (subscale approach: I want to prove to myself that I can be successful in my studies; subscale avoidance: I am currently studying because otherwise I would have a guilty conscience)
- External Regulation (I study primarily because I cannot get a well-paid job without academic training)

The internal consistencies of the scales (Cronbach's alpha between .75 and .90) are satisfactory (see Table 1). Factor-analytic studies have also shown that the five-dimensionality of the instrument could be mapped and is superior to a two-dimensional factor solution (autonomous and controlled regulation). The fit indices of the CFA are convincing: $\chi^2(78) = 390.503$; CFI = 0.975; TLI = .96; RSMEA = 0.035 (see also Thomas et al., 2018). The 15 items were offered with a 7-point Likert scale (1 = does not apply at all to 7 = applies 21 completely).

The needs satisfaction in studies (BPNS) was measured with the instrument from Heissel and colleagues (2018) translated from English (see also Chen et al., 2015). Reliabilities were satisfactory, ranging from .70 to .90 (see Table 2). A total of 24 items were rated on a 5-point Likert scale (1 = does not apply at all to 5 = applies completely). A CFA revealed good factor validity ($\chi^2(237) = 1566$; TLI = .92; CFI = .93; RMSEA = 0.06). The instrument captures the following scales (item examples are given in parentheses):

- BPNS Autonomy (I feel free in [online] study to choose what I do)
- BPNS Competence (I currently feel competent in my studies)
- BPNS Social Relatedness (I feel related to the people I spend time with in my [online] studies)

Sample

Sample 1 (before distance learning)
Pre-pandemic data were available from 1139 students of different majors (64% female, 34% male, 2% diverse or not specified), of whom 45% were enrolled in Austrian and 55% in German universities or colleges. The average number of semesters was 3.71 (SD = 2.96). 45% of the students indicated that they were pursuing a teaching degree, and the other students took mostly majors in the social sciences and humanities. Students averaged 21.10 years (SD = 5.14) in age. Data exist for this sample on motivational regulation (N = 1139) and BPNS (N = 494).

Sample 2 (during distance learning)
A total sample of 1835 students from eight universities in Austria and Germany took part in the online-based survey. The students had a mean age of 23,54 years (SD = 5.77), and 20.9% were male, 78.7 % female and 0.4% divers, while the mean in regard to the number of semesters was 5.85 (SD = 4.76). 56.4% of the students surveyed were pursuing a teaching degree at the time of the survey; all other students were majoring in social sciences and humanities.

5. Results and conclusion

The findings show that intrinsic and identified regulation are significantly lower than before the switch to distance learning (Table 1). In particular, intrinsic motivation has declined substantially (Cohen's d = 0.88). The decrease in identified regulation is slightly lower (d = 0.44). This could be attributed to the fact that identified regulation is associated with autonomous goals and is less affected by environmental change. Lie and colleagues (2020) also came to the same conclusion. The approach subscale of introjected regulation is also lower in the pandemic (Cohen's d = 0.20). Since this scale is moderately associated with autonomous regulation styles on the continuum of self-determination, this result is plausible.

In contrast, students describe themselves as significantly more introjected (subscale avoidance; d = 0.15) and externally regulated (d = 0.15).

Tab. 1: Motivational regulation before and during distance learning

			Before (N = 1139)	distance learning (N = 1835)				
Scale	Items	Alpha	M (SD)	M (SD)	U[1]	Z	p	d
Intrinsic regulation	3	.84/.90	4.67 (1.22)	3.32 (1,70)	538287,0	-21.43	.000	0.88
Identified regulation	3	.75/.75	5.39 (1.14)	4.83 (1.36)	768096,5	-11.13	.000	0.44
Introjected regulation								
approach	3	.74/.79	4.60 (1.44)	4.30 (1.57)	902898,0	-04.72	.000	0.20
avoidance	2	.61/.72	3.49 (1.45)	3.73 (1.67)	923503,5	-08.82	.000	0.15
Extrinsic regulation	3	.75/.70	4.30 (1.52)	4.51 (1.47)	933880,0	-03.56	.000	0.15

Note: scale: 1 = do not agree at all, 7 = do fully agree; 1: Mann-Whitney-U-Test for independent samples; d = Cohen's d

Basic need satisfaction also differs before and after the shift to distance learning. In precise, basic need satisfaction in competence (d = 0.76) and social relatedness (d = 1.33) are substantially lower. The impairment of the social dimension in distance learning has also been demonstrated in other recent studies (Adnan & Anwar, 2020; Wong, 2020). The basic need for autonomy also shows a moderately lower value in distance learning (d = 0.49).

Overall, the findings confirm hypotheses 1 to 3.

Tab. 2: Basic need satisfaction (BPNS) before and during distance learning

			Before (N = 494)	distance learning (N = 1177)				
Scale	Items	Alpha	M (SD)	M (SD)	U[1]	Z	p	d
BPNS autonomy	4	.76/.72	3.51 (0.76)	3.11 (0.84)	315364.0	-08.92	.000	0.49
BPNS competence	4	.88/.90	4.00 (0.71)	3.31 (0.98)	244531.0	-14.57	.000	0.76
BPNS relatedness	4	.84/.79	4.32 (0.74)	3.14 (0.94)	127857.5	-23.83	.000	1.33

Note: scale: 1 = do not agree at all, 7 = do fully agree; 1: Mann-Whitney-U-Test for independent samples; d = Cohen's d.

The structural equation model shows that basic needs can explain 64% of internal regulation and 63% of identified regulation. The controlled forms of motivation can be predicted much less. This is in line with theoretical expectations (see Ryan & Deci, 2017).

Intrinsic and identified regulation depend in particular on the satisfaction of autonomy (β = .60 / β =.71) and competence (β = .30 / β = .14). Social relatedness does not prove to be a relevant predictor of regulation styles in distance learning. Only competence predicts introjected (avoidance, β = -.23; approach β = 07) and external regulation (β = .12). As evident in other SDT-based studies extrinsic regulation is less well explained by the perceived satisfaction of the basic needs.

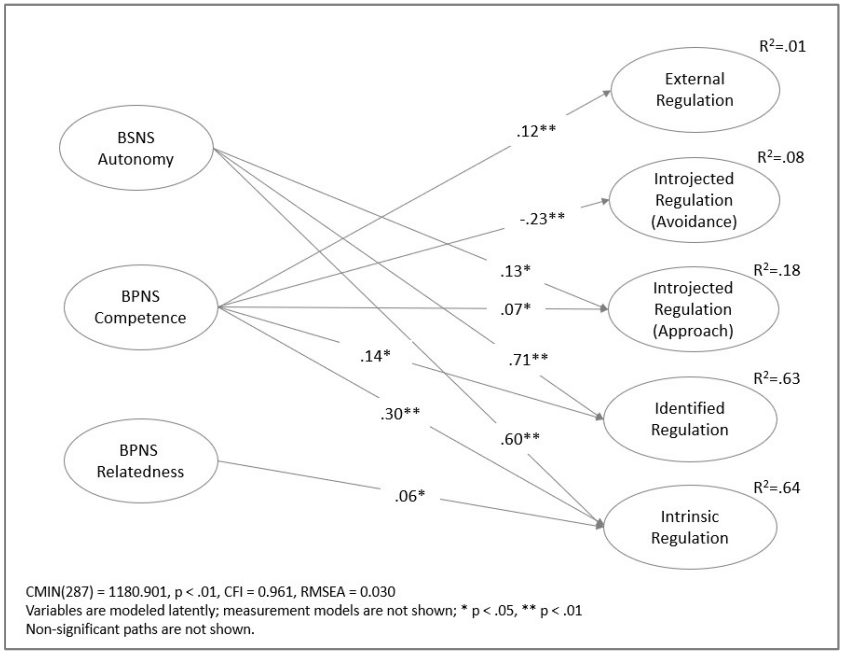

Figure 1: Structural equation model

However, it is worth discussing why social relatedness does not make a substantial contribution to explaining the autonomous forms of motivation in distance learning. After all, the differences between before and during distance learning were greatest in the case of social connectedness.
First, it must be noted that the basic needs are also correlated with each other. Since the other two needs explain more variance, the explanatory contribution of social relatedness is low due to the collinearity.

Further studies would have to clarify in detail why social relatedness correlates low with autonomous motivation. Qualitative studies or intervention studies would be appropriate here. Moreover, in other cultural contexts social relatedness could have a higher impact, and this also in distance learning (cf. e.g. Müller & Palekčić, 2005).
In summary, the results show that motivation and basic needs can change relatively quickly due to external influences such as the Covid-19 crisis. The major future challenge for the design of learning environments in distance learning is to support needs satisfaction.

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